

CLAIM LISTING:

1. (Original) A flush syringe assembly comprising:

a barrel including a cylindrical side wall having an inside surface defining a chamber for retaining fluid, an open proximal end and a distal end including a distal wall with a tip extending distally therefrom having a passageway therethrough in fluid communication with said chamber;

a plunger including an elongate body portion having a proximal end and a distal end, a stopper slidably positioned in fluid-tight engagement with said inside surface of said barrel for driving fluid out of said chamber by movement of said stopper relative to said barrel, said elongate body portion extending outwardly from said open proximal end of said barrel; and

means for moving additional fluid distally in said passageway at the completion of the flush procedure after distal motion of said plunger with respect to said barrel has stopped.

2. (Original) The syringe assembly of claim 1 wherein said means for moving fluid comprises said stopper including a distal end having a distal wall and a cavity therein defining an inside surface and a proximal end, said distal wall being flexible enough to collapse at least partially into said cavity under the liquid pressure of a flush procedure and to move back toward its original shape at the completion of the flush procedure to force additional fluid into said passageway.

3. (Original) The syringe assembly of claim 2 wherein a distal tip on said distal end of said plunger is connected to said stopper.

4. (Original) The syringe assembly of claim 2 wherein a distal tip on said distal end of said plunger includes a sealing surface around its periphery in fluid-tight engagement with said inside surface of said barrel.

5. (Original) The syringe assembly of claim 2 wherein said collapse of said distal wall occurs when said liquid pressure in said chamber is about 5 mm Hg (0.1 psi) or more.

6. (Original) The syringe of claim 2 wherein the volume of said additional fluid is about 0.001 ml or more when said syringe is connected to a peripheral catheter.

7. (Original) The syringe assembly of claim 9 wherein said additional fluid is delivered in a time of 0.5 second or more when said syringe is connected to a peripheral catheter.

8. (Original) The syringe assembly of claim 2 wherein said additional fluid is delivered in a time of 2.5 seconds or more when said syringe is connected to a peripheral catheter.

9. (Original) The syringe assembly of claim 1 wherein said stopper includes a conically shaped distal surface and said inside surface of said barrel at said distal wall is conically shaped.

10. (Original) The syringe assembly of claim 2 further including a spring at said inside surface of said cavity, said spring configured to compress when said stopper is in a collapsed position and to urge said distal wall from said collapsed position toward its original shape.

11. (Original) The syringe assembly of claim 10 wherein said spring is a coil spring.
12. (Original) The syringe assembly of claim 2 wherein said inside surface of said stopper includes a proximally directed projection configured to compress when said stopper is in a collapsed position and to urge said distal wall from said collapsed position toward its original shape.
13. (Original) The syringe assembly of claim 2 at least one rib on said inside surface of said stopper at said distal wall configured to deflect when said stopper is in a collapsed position and urge said distal wall from said collapsed position toward its original shape.
14. (Original) The syringe assembly of claim 2 further including said distal wall having an area of reduced thickness to lower the pressure required for said distal wall to collapse.
15. (Original) The syringe assembly of claim 14 wherein said area of reduced thickness includes a circular groove in said inside surface at said distal wall of said stopper.
16. (Original) The syringe assembly of claim 2 further including means for allowing air trapped in the stopper cavity to escape as said distal wall collapses.
17. (Original) The syringe assembly of claim 16 wherein said means for air to escape includes an aperture in said plunger communicating with said cavity of said stopper.

18. (Original) The syringe assembly of claim 1 including flush solution in said chamber.

19. (Original) The syringe assembly of claim 18 wherein said flush solution is selected from the group consisting of saline flush solution and heparin lock flush solution.

20. (Original) The syringe assembly of claim 19 further including a tip cap releasably connected to said tip of said syringe barrel for sealing said passageway.

21. (Original) The syringe assembly of claim 1 wherein said stopper is made of material selected from the list consisting of thermoplastic elastomers, natural rubber, synthetic rubber, thermoplastic materials and combinations thereof.

22. (Original) The syringe assembly of claim 1 further comprising a needle assembly including a cannula having a proximal end, a distal end and a lumen therethrough, and a hub having an open proximal end, containing a cavity and a distal end attached to said proximal end of said cannula so that said lumen is in fluid communication with said cavity, said needle assembly being removably attached to said tip of said barrel through engagement of said tip to said cavity so that said lumen is in fluid communication with said chamber.

23. (Original) An I.V. flush syringe assembly comprising:

a barrel including a cylindrical side wall having an inside surface defining a chamber for retaining fluid, an open proximal end and a distal end including a distal wall

with a tip extending distally therefrom having a passageway therethrough in fluid communication with said chamber;

a tip cap releasably connected to said tip for sealing said passageway;

a plunger including an elongate body portion having a proximal end and a distal end, a resilient stopper, a quantity of flush solution in said chamber, said stopper slidably positioned in fluid-tight engagement with said inside surface of said barrel for driving fluid out of said chamber by movement of said stopper relative to said barrel, said elongate body portion extending outwardly from said open proximal end of said barrel; and

structure for moving additional flush solution distally in said passageway after flush solution has been delivered from said chamber and distal motion of said plunger with respect to said barrel has stopped, including said stopper having a distal end including a distal wall and a cavity therein defining an inside surface and a proximal end, said distal wall being flexible enough to collapse at least partially, into said cavity under the liquid pressure and to move back toward its original shape at the completion of the flush procedure to force additional flush solution of at least 0.001 ml into said passageway when said syringe is connected to a peripheral catheter.

24. (Original) The syringe assembly of claim 23 wherein a distal tip on said distal end of said plunger is connected to said stopper.

25. (Original) The syringe assembly of claim 23 wherein a distal tip on said distal end of said plunger includes a sealing surface around its periphery in fluid-tight engagement with said inside surface of said barrel.

26. (Original) The syringe of claim 23 wherein said collapse of said distal wall occurs when said liquid pressure in said chamber is about 5 mm Hg (0.1 psi) or more.

27. (Original) The syringe assembly of claim 23 further including a spring at said inside surface of said cavity, said spring configured to compress when said stopper is in a collapsed position and to urge said distal wall from said collapsed position toward its original shape.

28. (Original) The syringe assembly of claim 27 wherein said spring is a coil spring.

29. (Original) The syringe assembly of claim 23 wherein said inside surface of said stopper includes a proximally directed projection configured to compress when said stopper is in a collapsed position and to urge said distal wall from said collapsed position toward its original shape.

30. (Original) The syringe assembly of claim 23 at least one rib on said inside surface of said stopper at said distal wall, configured to deflect when said stopper is in a collapsed position and urge said distal wall toward its original shape.

31. (Original) The syringe assembly of claim 23 further including said distal wall having an area of reduced thickness to lower the pressure required for said distal wall to collapse.

32. (Original) The syringe assembly of claim 12 wherein said area of reduced thickness includes a circular groove in said inside surface at said distal wall of said stopper.